Modifying a DIA Type Large Volume High Pressure Apparatus with X-ray Diffraction for the Rheological Studies	X17B1

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A DIA type large volume high pressure apparatus has been modified as a deformation apparatus for high pressure and high temperature studies. The modified apparatus can be used to study the rheological properties of mantle minerals up to 15 GPa and 1500C. Together with the X-ray diffraction method, we can measure the differential stress of mantle minerals quantitatively.

Using this modifed apparatus, we did some preliminary rheological studies on NaCl polycrystals up to 10GPa and 1000C. We also did one comparation experiment using the conventional DIA system. The results show that our modification can generate the differential stress inside the sample more efficiently than the conventional DIA system. However, the differential stress in the sample chamber generated by our modified DIA apparatus is ultimately limited by the yield stress of the sample. And the yield stress of the NaCl sample we get is quite consistent with the earlier studies with the DIA and diamond anvil apparatus.

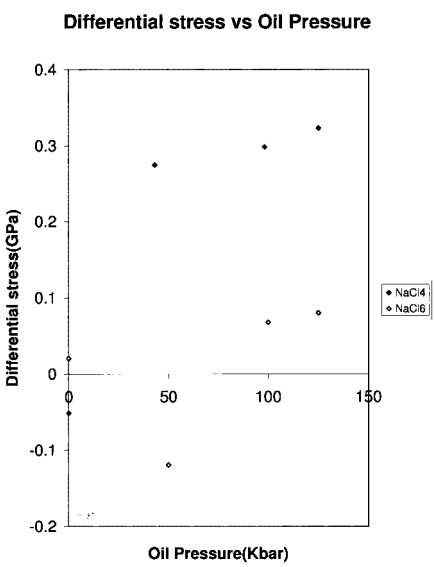

Figure 1. Differential stress vs oil pressure. $NaCl_4$: results using the modified DIA apparatus; $NaCl_6$: results using the conventional DIA apparatus.

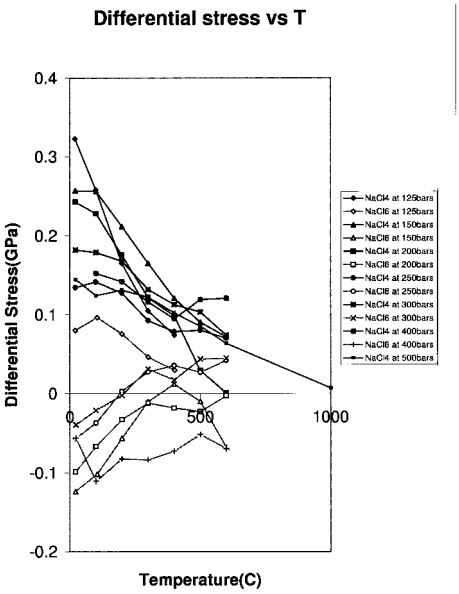

Figure 2. Differential stress vs temperature at the different pressures. $NaCl_4$ and $NaCl_6$ are the same as in Figure 1.